

Response

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Serial No.: 10/000,057

Confirmation No.: 9505

Filed: November 1, 2001

For: ABRASION RESISTANT COATING FOR STACKS OF FIBER CEMENT SIDING

Remarks

The Advisory Action mailed 9 May 2005 has been received and reviewed. No claims having been amended, the pending claims are claims 17-19, 21, and 31-52. Reconsideration and withdrawal of the rejections are respectfully requested.

Previous Response

Applicants respectfully request that the Examiner enter the Response of 21 April 2005.

The 35 U.S.C. §103(a) Rejection

The Examiner rejected claims 17-18, 31-32, and 42-50 under 35 U.S.C. §103(a) as being unpatentable over Blum (U.S. Patent No. 5,344,873) in view of Dai Nippon (JP 10-128902).

Applicants respectfully traverse this rejection.

"To establish a *prima facie* case of obviousness . . . there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings" M.P.E.P. §2143.

Applicants respectfully submit that there is no suggestion or motivation, either in the documents or in the knowledge generally available to one of ordinary skill in the art, to modify the documents. Blum does not disclose a coating that is "mar and abrasion resistant" (e.g., present claim 19). Blum discloses "an aqueous binder composition . . . a process for the production of a coating or sealing composition containing this aqueous binder" (e.g., abstract) and that these compositions can be used for "the painting and sealing of wood and wood materials, such as chipboard, fiber board" (e.g., column 7, lines 8-10) and provide good solvent resistance (e.g., column 8, lines 25, and 40-42).

The Examiner asserted that "the reference [Blum] does not exemplify a method of providing a fiberboard cement substrate, coating the substrate with a sealer, coating the sealer with a primer, coating the primer with a decorative coating, coating the decorative coating with a top coating, and curing the top coating" and that "Dai Nippon demonstrates that such a process is

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conventional in the cement board art" (e.g., page 2 of the Final Office Action mailed 7 February 2005). Applicants earnestly disagree that Dai Nippon demonstrates "such a process."

Dai Nippon discloses an "Inorganic Decorative Board Having Excellent Anti-fouling Property and Production Method Thereof" (e.g., title). Dai Nippon discloses a material that suppresses "the generation of peel-off when being applied in the kitchen . . . and [to] improve the flame-preventing property by successively *laminating* a base coat layer, a picture printing layer, and a top coat layer . . . on the surface of an inorganic substrate 2" (e.g., abstract, emphasis added). Applicants respectfully submit that Dai Nippon's lamination process does not exemplify the methods provided by the present invention (e.g., present claim 17).

However, the Examiner asserted that "the claims are not written to exclude lamination, since lamination can be considered a coating process" (e.g., page 2, box 11, lines 11-12, Advisory Action mailed 9 May 2005). Applicants earnestly disagree.

"Claim terms are presumed to have the ordinary and customary meanings attributed to them by those of ordinary skill in the art." *Sunrace Roots Enter. Co. v. SRAM Corp.*, 336 F.3d 1298, 1302, 67 USPQ2d 1438, 1441 (Fed. Cir. 2003). M.P.E.P. §2106.

Although lamination may be used in steps not recited in the present claims, Applicants respectfully submit that one of skill in the art would not consider "lamination" as a "coating process" as recited in the present claims. For example, "coatings" is defined as "protective and/or decorative layers; produced by metering a liquid (solution) onto a moving surface" (e.g., page 105, left column, Dorit & Herman Noether, *Encyclopedic Dictionary of Chemical Technology*, 1993, Exhibit A). Furthermore, a "coating process" is defined as "the application of liquid to a traveling substrate" (e.g., page 292, right column, *Kirk-Othmer's Concise Encyclopedia of Chemical Technology*, 1985, Exhibit B). On the other hand, "lamination" is defined as "[a] plastic protective film on a printed sheet that has been bonded by heat and pressure" (e.g., page 1044, right column, *McGraw-Hill's Dictionary of Scientific and Technical Terms*, 4th Edition, 1989, Exhibit C).

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Furthermore, the "claims must be interpreted 'in view of the specification'" (e.g., M.P.E.P. §2106. For example, the specification recites the use of the solution-based sealer in Olympic FC sealer (e.g., page 5, lines 26-27, present specification). Applicants respectfully submit that OLYMPIC FC sealer is commercially available as a "viscous liquid" in a 20.45% solids solution (e.g., page 2, Section 9, Material Safety Data Sheet, Product ID: 54500, Olympic F/C Latex-Sealer manufactured by PPG Industries, Inc., Exhibit D).

As such, Applicants respectfully submit that one of skill in the art would not consider "lamination" as a "coating process" as practiced by the present invention.

Further, the Examiner also alleged that she had previously "pointed to motivation for using the methods and layer structures of the Dai Nippon reference in Blum's methods and layer structures" (e.g., page 2, box 11, lines 12-13, Advisory Action mailed 9 May 2005). Applicants earnestly disagree that there is "motivation for using the methods and layer structures of the Dai Nippon reference in Blum's methods and layer structures."

Although Dai Nippon desires to "form the coat excellent in surface physical properties such as resistance to contamination, abrasion-proof nature, and solvent resistance" (e.g., paragraph [0014]), Dai Nippon does not teach that there is a problem with abrasion nor discloses that topcoat 5 is "mar and abrasion resistant" (e.g., present claim 19). As a result, there is no reason nor suggestion to substitute a top coat of Blum for that of Dai Nippon.

Applicants respectfully submit that the combination of Blum with Dai Nippon in an obviousness rejection can only occur by the impermissible use of hindsight reasoning. In order to establish a *prima facie* case of obviousness, the references must teach or suggest all the claim limitations. Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 USPQ 81 at 93 ("Focusing on the obviousness of substitutions and differences instead of on the invention as a whole, . . . was a legally improper way to simplify the difficult determination of obviousness."). One cannot "simply [to] engage in a hindsight reconstruction of the claimed invention, using the Applicant's structure as a template and selecting elements from references to fill the gaps." In re Gorman, 933 F2d 982, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). Further, the suggestion for combining the teachings of the prior art to make the invention must be founded in the prior art

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and not in the teachings of Applicants' disclosure. In re Dow Chem., 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). Here, the cited art does not suggest that the combination of its teachings would result in the present invention.

Applicants respectfully submit that neither Blum nor Dai Nippon address the problem of providing a coating that is "mar and abrasion resistant" (e.g., present claim 17). Therefore, there cannot be motivation to combine the documents to provide a method that results in such a product.

As such, Applicants respectfully submit that claims 17-18, 31-32, and 42-50 are not obvious over the combination of Blum and Dai Nippon. Applicants respectfully request reconsideration and withdrawal of the rejection.

The Examiner rejected claims 51-52 under 35 U.S.C. §103(a) as being unpatentable over Blum (U.S. Patent No. 5,344,873) in view of Dai Nippon (JP 10-128902), as applied to claims 17-18, 31-32, and 42-50 above, and further in view of the Applicants' admitted prior art. Applicants respectfully traverse this rejection.

The Examiner asserted that "[t]he applicants admit that traditional practices using fiber cement board materials include a stacking operation for ease of shipping" (e.g., page 4, Final Office Action mailed 7 February 2005). As noted herein above, Applicants submit that there is no motivation for a person of ordinary skill in the art to combine the teachings of Blum and Dai Nippon. Nothing is identified within the Applicants' prior art disclosure that remedies this deficiency.

As such, Applicants respectfully submit that claims 51-52 are not obvious over the combination of Blum and Dai Nippon, and further in view of the Applicants' admitted prior art. Applicants respectfully request reconsideration and withdrawal of the rejection.

The Examiner rejected claims 33-41 under 35 U.S.C. §103(a) as being unpatentable over Blum (U.S. Patent No. 5,344,873) in view of Dai Nippon (JP 10-128902), as applied to claims

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17-18, 31-32, and 42-50 above, and further in view of Takahashi (U.S. Patent No. 6,103,352).

Applicants respectfully traverse this rejection.

Takahashi discloses a decorative sheet that comprises "a substrate sheet 1; a contiguous layer 4 provided on the substrate sheet 1; and a surface protective layer 5 provided on the contiguous layer 4 containing a compound having active hydrogen, the surface protective layer 5 comprising an ionizing radiation-curing resin and an isocyanate compound, the contiguous layer 4 and the surface protective layer 5 being in a cured state" (e.g., abstract). Further, Takahashi's decorative sheet possesses "high adhesive strength between the surface protective layer and each layer *laminated* onto the surface protective layer and, in addition, excellent scratch resistance" (e.g., column 1, line 31-34, emphasis added).

The Examiner asserted that Takahashi has been "relied upon as a secondary reference to provide teachings and motivation for using specific coating thicknesses and abrasion resistance agents" (e.g., page 2, box 11, lines 14-15, Advisory Action mailed 9 May 2005).

As noted herein above, Applicants submit that there is no motivation for a person of ordinary skill in the art to combine the teachings of Blum and Dai Nippon. Nothing is identified within Takahashi that remedies this deficiency.

As such, Applicants respectfully submit that claims 33-41 are not obvious over the combination of Blum and Dai Nippon, as applied to claims 17-18, 31-32, and 42-50 above, and further in view of Takahashi. Applicants respectfully request reconsideration and withdrawal of the rejection.

The Examiner rejected claims 19 and 21 under 35 U.S.C. §103(a) as being unpatentable over Blum (U.S. Patent No. 5,344,873) in view of Dai Nippon (JP 10-128902), and Takahashi (U.S. Patent No. 6,103,352) as applied to claims 33-41 above, and further in view of Harper et al. (U.S. Patent No. 4,637,860). Applicants respectfully traverse this rejection.

Harper et al. disclose "a process for the manufacture of a non-asbestos corrugated sheet" (e.g. abstract). As noted herein above, Applicants submit that there is no motivation for a person

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of ordinary skill in the art to combine the teachings of Blum, Dai Nippon and Takahashi.

Nothing is identified within Harper et al. that remedies this deficiency.

As such, Applicants respectfully submit that claims 19 and 21 are not obvious over the combination of Blum in view of Dai Nippon, and Takahashi as applied to claims 33-41 above, and further in view of Harper et al. Applicants respectfully request reconsideration and withdrawal of the rejection.

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Summary

It is respectfully submitted that all the pending claims are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

CERTIFICATE UNDER 37 C.F.R. 1.8:

The undersigned hereby certifies that this paper is being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Mail Stop Amendment, Commissioner for Patents, Mail Stop RCE, P.O. Box 1450, Alexandria, VA 22313-1450, on this 7 day of June, 2005, at 4:05 pm (Central Time).

Name:

Sandy TruehartDate: June 7, 2005Respectfully submitted for
DARGONTINA ET AL.

By

Mueeting, Raasch & Gebhardt, P.A.

P.O. Box 581415

Minneapolis, MN 55458-1415

Phone: (612)305-1220

Facsimile: (612)305-1228

Customer Number 26813

By: Ann M. Mueeting

Ann M. Mueeting

Reg. No. 33,977

Direct Dial (612)305-1217

EXHIBIT A

ENCYCLOPEDIC DICTIONARY OF Chemical Technology

by
Dorit and Herman Noether



Dorit and Herman Noether
20 Greenbriar Drive
Summit, NJ 07901

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codon

coal liquefaction: direct liquefaction of coal is achieved by pyrolysis at 900–1200°F and ≤1000 psig in the presence of a carrier gas; products differ depending on operating conditions, e.g., the H-Coal process uses a Co-Mo catalyst and yields fuel oil as well as naphtha and gas; the Exxon Donor Solvent (EDS) and the Solvent Refined Coal (SCR I) processes use molecular hydrogen and yield liquid boiler fuel as well as gas, naphtha, and liquid-pressurized gas (LPG); the Solvent Refined Coal II (SCR II) gives solid boiler fuel; and the H-Coal process yields a crude oil mixture (syncrude); indirect liquefaction uses gasified coal as raw material: in the original Fischer-Tropsch process syngas was reacted over an iron or cobalt catalyst at 330°C and 350 psi to produce liquid hydrocarbons and waxes; the process has been modernized particularly by use of different catalysts (e.g., rhodium complexes, transition metal carbonyls, and oxides of Al, Cu, Mo, V, and Zn); the SASOL process, which produces gasoline, exemplifies a modern Fischer-Tropsch synthesis

coal rank: coal is classified by rank based on fixed carbon, volatile matter, and heating value. Ranks in order of decreasing calorific value are: anthracitic, bituminous, subbituminous, and lignitic

coal tar: *see* coal

coal tar creosote: a wood preservative consisting of a mixture of aromatic hydrocarbons (fluorene, anthracene, phenanthrene, and naphthalene) containing ≤5% tar acids (phenols, xylenols, cresols, and naphthols) and ≤5% tar bases (pyridines, quinolines, and acridines); creosote derives its usefulness because it is highly toxic to insects, penetrates wood well, and is water insoluble

coarse filament yarn: yarn weighing 800–1200 denier; use: for reinforcement in tires and conveyor belts

coatings: protective and/or decorative layers; produced by metering a liquid (solution) onto

a moving surface, by spraying or by vapor deposition; coatings serve to protect against abrasion, bacteria, corrosion, fire, fouling, gas permeability, static, or weathering (light, mildew, moisture and water, oxidation); they confer wash-and-wear characteristics to fabrics, dissipate heat for reentry space vehicles, reduce surface friction, absorb sound; coating formulations may contain resins in oil-modified alkyds (e.g., diisocyanates, epoxies, nitrocellulose, polystyrene, silicone, urethanes, vinyls), thermosetting resins may be used without a vehicle; anticorrosive marine coatings contain biocidal organotin compounds to protect against fouling; decorative coatings provide color and gloss; widely used in industries including building, industrial equipment, metal, textile, and wood

coazervation: *see* coacervation

cobalt: Co; metallic element; the metal is widely used in alloys and as catalyst, e.g., for the aromatization of hexane; for cracking of methanol to CO and hydrogen; for dehydro-sulfurization of naphtha and thiophene; for Fischer-Tropsch synthesis; for hydroformylation of olefins; for hydrogenation of ketones and nitriles; for oxidation of ArCH₃ to ArCOOH (o-xylene to phthalic anhydride); for hydrogenation of coal liquids

cochineal: red dye stuff (carmine) obtained from dried bodies of insects

cocoa butter: fat derived from the cocoa bean; the major ingredients are the glycerides of oleic, palmitic, and stearic acids; use: confectionary coating

coconut oil: important vegetable oil; its high lauric acid (CH₃(CH₂)₁₀COOH) content makes it a good raw material for soap manufacture; coconut oil soap is firm and is resistant to oxidation

codeine: methylmorphine; opiate; use: analgesic, cough suppressant

codon: the sequence of three bases on mes-

EXHIBIT B

KIRK-OTHMER
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OF CHEMICAL TECHNOLOGY

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292 COAL GAS

is processed in a carbonizer, where volatile materials are driven off and the coal is partly pyrolyzed to form a relatively clean gaseous fuel. This off-gas can be used either as a clean fuel or as feedstock for various chemical processes. The nonvolatile char residue can be used as fuel for power generation (see Fuels, synthetic—gaseous).

Gas turbine bottom plants. The MHD generator can be used effectively in conjunction with a gas-turbine or air-turbine plant.

STEWART WAY
Westinghouse Electric Corp.

J. B. Heywood and G.J. Womack, *Open Cycle MHD Power Generation*, Pergamon Press, London, 1969.

R. Bünde, H. Muntenbruch, J. Raeder, R. Volk, G. Zankl, *MHD Power Generation*, Springer, New York, 1975.

M. Petrick, B.Y. Shumaytsky, *Open Cycle Magnetohydrodynamic Electrical Power Generation*, Argonne National Laboratory, Argonne, Ill., 1978.

COAL GAS. See Coal chemicals and feedstocks; Coal conversion processes; Tar and pitch.

COAL TAR. See Coal conversion processes; Tar and pitch.

COATED FABRICS

A coated fabric is a construction that combines the beneficial properties of a textile and a polymer. The textile (fabric) provides tensile strength, tear strength, and elongation control. The coating is chosen to provide protection against the environment in the intended use. A polyurethane might be chosen to protect against abrasion or a polychloroprene (Neoprene) to protect against oil (see Urethane polymers; Elastomers, synthetic).

Textile Component

For many years cotton (qv) and wool (qv) were used as primary textile components, contributing the properties of strength, elongation control, and aesthetics. Polyester, by itself and in combination with cotton, is used extensively in coated fabrics. Nylon is the strongest of the commonly used fibers. Rayon and glass fibers are the least used; rayon has low adhesion and glass is brittle.

There are many choices in textile construction. The original, and still the most commonly used, is the woven fabric. Knitted fabrics are used where moderate strength and considerable elongation are required. Many types of nonwoven fabrics are used as substrates (see Nonwoven textiles fabrics).

The construction that results from either weaving or knitting is called a greige good. Other steps are required before the fabric can be coated: scouring to remove surface impurities; and heat setting to correct width and minimize shrinkage during coating.

Polymer Component

In addition to natural rubber and polychloroprene, other polymers in use include: styrene-butadiene (SBR), polyisoprene, polyisobutylene (Vistanex), isobutylene-isoprene copolymer (Butyl), polysulfides (Thiokol), polyacrylonitrile (Puracril), silicones, chlorosulfonated polyethylene (Hypalon), poly(vinyl butyral), acrylic polymers, polyurethanes, ethylene-propylene copolymer (Royalene), fluorocarbons (Viton), polybutadiene, polyolefins, and many more. Copolymerizations and physical blends make the number available staggering (see Copolymers; Olefin polymers; Polymers containing sulfur; Acrylic ester polymers; Vinyl polymers; Fluorine compounds; Acrylonitrile polymers; Silicon compounds; Urethane polymers).

Processing

Coated fabrics can be prepared by lamination, direct calendaring, direct coating or transfer coating (see Coating processes). The basic

problem in coating is to bring the polymer and the textile together without altering undesirably the properties of the textile. A technique in applying polymers to a textile requires having the polymer in a fluid condition, which requires heat. Therefore, damage to synthetic or thermoplastic fabric may occur.

Coated fabrics can be decorated by printing with an ink. If a textured surface is desired, the coated fabric is heated to soften it and pressure is applied by an engraved embossing roll. The final layer is called a topcoat. Most coatings are tacky enough to stick to themselves (block) during stacking or rolling. The main purpose of the slip is to prevent blocking (see Adherents).

Health and Safety Factors

Some materials used in coating operations have been identified by the U.S. Government as being hazardous to the workers' health. Coating operations should not be initiated without consulting the *Federal Regulations on Occupational Safety and Health Standards, Subpart Z and Hazardous Substances*.

FRED N. TET
Reeves Brothers

M. Morten, *Rubber Technology*, Van Nostrand Reinhold Co., New York, 1973.

COATING PROCESSES

Plastic film-forming materials may be applied as coatings in different processes. Coatings may be applied for either functional purposes (eg, waterproofing, flameproofing, mildewproofing, abrasion resistance, rust resistance, reflection, insulation, adhesion, or a coating impermeable to gases and liquids) or decorative purposes (eg, gold color on aluminum foil or wrapping paper).

In addition to coated, shaped rigid articles such as automobile furniture frames, machinery, etc, the range of coated web materials includes a wide spectrum of products such as artificial garment interlinings, impermeable products such as shower curtains, book bindings, paper and paperboard, a variety of tapes, coated strips for building and furniture applications, hard-surface phenolic-melamine laminations for furniture and insulating uses, floor coverings, food packaging and other coated films, and coated paper and fiber panels.

Processes

A coating process is the application of liquid to a traveling substrate. The primary substrates include paper and paperboard films, foils, nonwovens, and wovens. The coating principles are suited to continuous webs than to short individual sheets. In general, there is an ideal coater arrangement for any given product; but most machines are required to produce many different products with different coating thicknesses and the machine is therefore usually a compromise for several applications.

All coating machines contain application and metering devices in order to ensure that a given quantity of coating is retained on the substrate, it is necessary to incorporate the metering principle. This can be tension sensitive and tension insensitive. Tension-sensitive (eg, the metering rod) simply means that the ability of the machine to maintain coating weight is dependent on the ability of the process line to maintain a constant substrate tension. Tension-insensitive coating stations have the inherent ability to maintain coat weight when web tensions vary.

Brush-coating methods are best suited to slow-drying coatings such as oilcresinous paints, starches, latexes, or emulsions. They permit application of a flawless coating, such as required on playing cards, the uniform coverage and penetration of uneven surfaces, such as required on rough fiber panels. Brush-coating machines have been largely replaced by air-knife coaters. Advantages: smooth application; not tension sensitive. Disadvantages: noisy; high maintenance; slow speed; high viscosity; difficult to clean.

The simplest, least expensive, and yet one of the best coating methods is rigid knife coating, either unsupported or supported, with the latter being the more accurate. Advantages: low cost; simple, compact; precision to 1% variation; heavy coat weights, 0.012–2.5 mm wet; high viscosities up to 100,000 mPa·s (~ cP); levels rough surfaces; low solvent loss; produces uniform total web cross section. Disadvantages: streaking or scratches; passing slices; messy on web breaks; contacting-type edge dams; coating eight changes with web caliber or profile; speeds above 300 m/min.

The familiar example of sheep wool or synthetic fleece-covered hand-painting rolls is an excellent illustration of the fibrous belt coating method preferred for the application of latex and emulsion coatings.

The metering rod coater (Fig. 1), also known as a Mayer rod coater, utilizes a driven single-roll applicator to coat in either direction and is followed by a driven metering rod assembly to control weight. Advantages: low cost; simple, compact. Disadvantages: Mayer rod wear; rod holder wear; speed above 300 m/min; high viscosity; high cost weight.

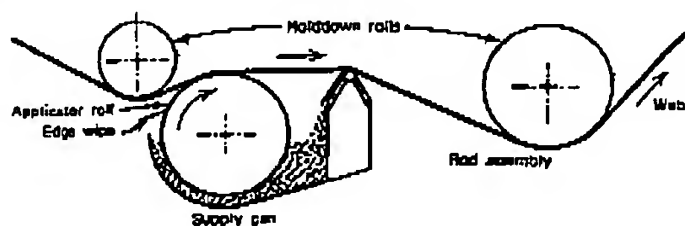


Figure 1. Metering rod coater.

The flexible-blade coater is known as the puddle coater. Its advantages are high speed, low coat weight, and short dwell. Disadvantages include: high coating loss on web breaks; backing roll wear from dikes; poor coat-weight running adjustment; poor operator vantage point; difficult to change doctor blade; difficult to filter coating effectively; difficult to go off-coat.

A second-generation blade coater is known as the flooded-nip, inverta-blade, or roll applicator. The latest blade coater arrangement is the twin-blade concept that consists of two fountain-blade coaters back to back without a backing roll.

One of the simplest coating machines used today on films that have stringent optical requirements utilizes the meniscus principle. Advantages: excellent precision application; produces good optical qualities with minimum pattern; does not scratch substrate or undercoat; does not distort or elongate substrate; low coating weight; low viscosity; clean room qualities. Disadvantages: slow speed; high viscosity; coat weight changes with speed and viscosity; sensitive to room air currents; sensitive to air bubbles and ripples; high coating weight; low speed; different width-back-up roll for each web width.

There are many types of kiss-roll coaters. They are usually tension sensitive and require a postmetering or smoothing device such as a metering rod or air knife.

Size-press coaters are used to apply aqueous sizing materials to fabrics, but more specifically on machines making paper and paperboard. Advantages: simple; compact; easy to maintain; can add size to either or both sides. Disadvantages: film split pattern; poor coating-weight control; reduces caliper; low solids, low coating weight.

Paperboard surface characteristics are improved by adding water bases to the steel roll calender stack on the board-making machine. Advantages: simple; inexpensive; improves end product; reduces curl; can treat either or both sides. Disadvantages: corrosion of rolls covered by solutions; usually slows machine process down because of additional drying requirements; reduces caliper; increases bulk density.

The transfer-roll coater, also known as the Kimberly-Clark-Mead (KCM), upgrades the performance of a conventional two-roll size press so that size solutions and coatings can be applied in a single station at higher solids and/or coat weights. Advantages: high speed; adjusts coating weight while running; high solids; high viscosity; can apply two different formulas simultaneously; easy to thread. Disadvantages: roll deflection compensation is required to ensure uniform coating weight across the machine.

Direct gravure coaters are the most accurate of the roll-type coaters. The coating weight is usually controlled by proper selection of the gravure roll etch. Advantages: simple to operate; compact; easy to maintain coating weight; coats a wide range of substrate materials; low solvent or heat loss; not tension sensitive; gives low coating weights. Disadvantages: difficult to change coating weight except on reverse application; backing roll is undercut for substrate width; gravure roll maintenance and life; doctor blade maintenance; high viscosity; film-split pattern; coating weights change with speed.

In offset or indirect gravure, a steel back-up roll is added above the direct-gravure roll arrangement allowing an additional film split before the application to the substrate. This minimizes coating patterns and reduces coat weight. Advantages: low coating weight; can adjust coating weight while running; high speed; minimal film-split gravure-cell patterns; higher viscosity; good coating-weight stability with process speed changes. Disadvantages: high coating weight; hot melt cools on resilient roll.

Both sides of a substrate can be simultaneously coated by a symmetrical coater arrangement. However, it is limited to low viscosities and web-speed applicator rolls that can form a pattern. It is commonly used for the application of primers or precoats to a plastic web.

During the early 1970s, printing multi-or single-color designs on fabrics was an important development. Rather than flexographic printing directly onto the fabric with its shrinkage and register problems, the patterns are heat-transferred from a release sheet. The release sheet consists of a base paper with a release coating or a web of foil.

The vertical or in-line reverse-roll coater utilizes the principles of the reverse-roll kiss coater in addition to a back-up roll above the applicator roll to eliminate the tension-sensitive application. Advantages: open design; simple; wide range of coating weights, process speeds, and viscosity; applies a uniform coating even with substrate caliber variations; not tension sensitive. Disadvantages: solvent evaporation; deterioration of the resilient roll caused by solvents; solids buildup; contamination buildup; scratches on sensitive substrates; new top roll for each web width; promotes air bubbles; strike-through on open webs.

The three-roll nip-fed coater consists of a rubber-covered back-up roll and precision metal-applicator rolls. Advantages: low solvent loss; wide range of coating weights, viscosity, and speeds; improved resilient roll life; maintains coat weight even with caliber variations; not tension sensitive. Disadvantages: end-dam maintenance and wear on coating rolls; coating streaks by particles in the nip; danger of clashing and damaging metering and applicator rolls; poor operator vantage point when adjusting coater; TIR (total indicator run out) maintenance; promotes air bubbles; backing-roll strike-through on open webs; backing-roll maintenance.

Saturators are webs designed to control the amount of residual coating solution evenly distributed through the cross-sectional area of a substrate. Final coat weights are often referred to in percent pick-up. Saturating-grade substrates include porous or unsized papers, creped paper, woven fiberglass, canvas, and nonwoven and cotton linter. Products of saturators include masking tape, counter tops, electric circuit boards, fish poles, and air and oil filters, to name a few. Three basic methods of saturating include dip and scrape, dip and squeeze, and reverse roll.

Many plastic compositions can be softened by heat and formed into self-supporting sheets by squeezing between heated iron calender rolls (Fig. 2).

Film-forming materials can be applied to continuous substrates by cast-coating methods, i.e., the process that includes contact of a wet coated surface with a smooth polished drum or metal belt during the drying or fusing operation. This process gives a flat-coated surface for

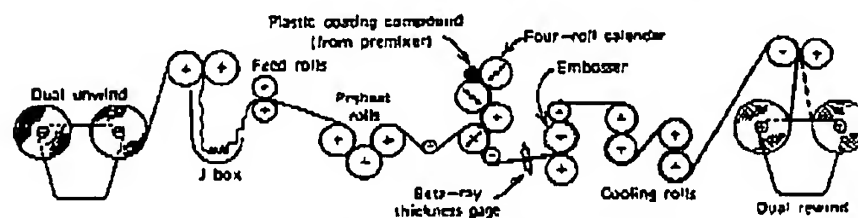


Figure 2. Z calender-coating arrangement.

294 COATINGS, INDUSTRIAL

decorative effects or for subsequent printing operations (see Printing processes). In the precast-coating process, a metered coating is deposited on a metal drum or metal belt followed by contact with the substrate and transfer of the coated material from the substrate, resulting in a smooth coated finish.

Powdered thermoplastic resins (particle size 25–200 μm) may be applied by flame-spray coating methods, principally on metallic substrates. They also may be applied by electrostatic attraction by spray-gun delivery.

Irregularly shaped objects are frequently coated by immersion in a coating composition, and then removed, drained, and dried or baked. Coating thickness is determined by the use. Tears or drops of coating at the bottom of dip-coated articles may be removed by electrostatic attraction as the article is moved along the conveyor.

Plastic coatings may be applied by spraying on irregularly shaped and compound curved or sharp-edged surfaces. The principal distinction in spray-gun design depends on the method used to obtain atomization of the coating liquid.

In pressure atomization or airless spraying, the coating is delivered to the nozzle under very high pressure and atomization results from dispersion in air as it leaves the nozzle. Air atomization spray-nozzle design depends on the impingement of an air stream against the coating to break it into small droplets and carry it to the surface to be coated. Most spray-nozzle operations require the fluid coating to be delivered through the nozzle under pressure rather than by suction from its supply source. Multiple-component spray nozzles may be arranged for internal mixing or external mixing of components. Materials of short pot life such as epoxy resins, polyurethanes, polyesters, etc., may be mixed and applied as coatings in this manner.

Many coating materials of suitable dielectric constant may be electrically polarized so that they are attracted to a grounded or oppositely charged surface. This principle (electrophoresis) has been used for many years in electrostatic spraying equipment. The coating particles may be generated by airless or air-atomized spray nozzles, centrifugal force, or electric attraction. Practical applications extend from paint or plastic solutions and suspensions to hot-melt compositions and powdered resins.

Many monomers can be polymerized directly on a substrate to form a uniform surface coating. Several different methods are used: magnetically contained glow discharge; exposure to an electron beam; and exposure to ultraviolet radiation (see Radiation curing).

In the curtain-coating process, the coating composition is delivered in a falling sheet or curtain to the substrate, which is moved through the curtain at a controlled rate. The principal limitation of this process is that the coating composition must be sufficiently fluid to fall freely and sufficiently cohesive to present a continuous film to the substrate.

Extrusion coating is the process of melting, metering, combining, and cooling a molten homogeneous sheet of thermoplastic material onto a continuous substrate such as paper, paperboard, film, foil, or fabric. Today's expanding food-packaging industry is the direct result of packaging improvements that can be attained by altering the surface and physical characteristics of a flexible web by the extrusion-coating process (see Film and sheeting materials).

Drying Systems

Drying systems are a very important part of the coating process since once a coating has been properly applied to a substrate, it must be conveyed, dried, and cured before the coated side can be contacted again. The drying system is based on the available fuel for the heat source, strength or stability of the coated substrate and the maximum rate at which evaporation and curing can be accomplished without detrimental effect on the end product (see Drying). The most common heat sources for drying include steam, oil, dual gas (natural and propane) and/or oil, electric radiation, ultraviolet light, and high frequency generation. Drying can be contacting or noncontacting.

STANLEY C. ZINK
The Black Clawson Co.

Reviewed by
GEORGE L. BOOTH
The Black Clawson Co.

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COATINGS, INDUSTRIAL

Coatings are available as liquid or fusible compositions. Table 1 gives a classification of coatings formulations. The liquids are usually aqueous or organic solutions. The coatings are applied by the user to the substrates, allowed to flow out smoothly, chiefly by forces of surface tension, and then cured to the final solid form. An industrial organic coating usually comprises an organic binder, pigments, a carrier liquid (sometimes omitted), and various additives.

The binder exists in the final film as a polymer of high molecular weight that may or may not be cross-linked. It is primarily responsible for the plastic quality of the film. Binders are grouped into certain overlapping classes such as acrylic, vinyl, alkyd, polyester, etc. The molecular structure of the binder and the forces operating between the molecules largely determine the mechanical properties.

The pigments, which may be organic or inorganic, contribute primarily to opacity and color, in addition to durability, hardness, adhesion, and particular rheological properties of the coating in fluid form.

Table 1. Formulation Possibilities^a of Synthetic Resins in Coatings Formulation^b

Vehicle system	Uses
Class 1: Vehicles containing oil-modified alkyds or other polymers containing drying oil	
(1) oxidizing alkyd resins (sometimes mixed with oleoresinous varnishes)	(1) architectural enamels, house paints, interior paints, flat wall paints, baking and air drying undercoats and enamels for machinery, metal housing, structural units, and other factory products
(2) alkyd and phenoplast alkyd and nitrocellulose alkyd and chlorinated rubber alkyd and polystyrene alkyd and diisocyanate alkyd and vinyl and epoxy	(2) air-drying or low-temperature baking undercoats and enamels (for metal products that have more plasticlike film properties than is possible to obtain with alkyds alone)
(3) alkyd and aminoplast alkyd and aminoplast and epoxy alkyd and silicone	(3) similar uses as above, but where a high premium is placed on color retention, and superior chemical and heat resistance
(4) oil-modified epoxy resins and aminoplast	(4) air-drying or baking-type undercoats and enamels; improved baking enamels and undercoats
Class 2: Vehicle systems containing no alkyd or drying oil	
(5) vinyl acetate and/or phenolic allylaminoplast alkyd epoxy and 2,4,6-trimethylphenyl ether	(5) chemically resistant baking undercoats and enamels
(6) phenoplasts (with or without epoxy, or vinylacetate, or aminoplast)	(6) thermosetting undercoats and/or enamels for high corrosion protection, especially in the film (not resistant to distribution, moderate temperature setting materials for corrosion and abrasion protection)
(7) polyester and triazine resin allyl polyester silicone thermosetting acrylics complex amino resins some other polymers	(7) chemical and distribution resistant, clear films and pigmented baking enamels for metallic and nonmetallic substrates (thermosetting film formers)
(8) vinyl acetate-chloride copolymers vinylidene or vinyl chloride-acrylonitrile copolymers butadiene copolymers acrylic copolymers poly(vinyl acetate)	(8) thermoplastic lacquers, baking or air drying emulsion paints for production finishes on nonmetallic goods such as architectural board, molded plastics, fire-retardant and corrosion-protective mantles, exterior house paints, and interior decorative paints in emulsion type
(9) nylon some cellulose esters and ethers polyurethanes polytetrafluoroethylene poly(vinyl acetate) saturated polyesters unsaturated polyesters and styrene epoxy and polyamide copolymers of ethylene or propylene	(9) special type of coatings, putting compounds, mastics, etc. for electrical insulation and corrosion protection

^a Commercial formulations are generally proprietary.

^b Courtesy Chemistry in Canada

COATINGS, RESISTANT

Coatings are classified as primers that are applied directly to a substrate or as topcoats. The latter are applied over a primer and are usually the last coat. Intermediate coats are called sealers. In some uses, one coat satisfies all requirements.

Industrial coatings are generally applied with specialized machinery representing a large investment. Coating properties must be controlled carefully to ensure continuous and satisfactory application (see Coating processes). Properties to be controlled include rheological characteristics, stability, color, smoothness or gloss, metallic luster, durability, adhesion, permeability, hardness, flexibility, and protection of the substrate against deterioration.

Government Regulations

(1) In 1974, the EPA set national air-quality standards for particulates, sulfur dioxide, carbon monoxide, photochemical oxidants, and hydrocarbons (see Air pollution). The standards for photochemical oxidants and hydrocarbons in the atmosphere are most significant for the coatings industry. The concentration of photochemical oxidants is limited to $160 \mu\text{g}/\text{m}^3$ as the maximum average concentration for one hour; this 1-h concentration is not to be exceeded more than once per year. Hydrocarbon standards are similarly set at $100 \mu\text{g}/\text{m}^3$. The states are responsible for local regulations that allow the national standards to be met. These limit the content of volatile solvents in coating formulations.

(2) The Water Pollution Control Act amendment of 1972 extends the Federal authority to all United States water. By July 1, 1984 industrial plants must reduce pollutants using the best feasible measures so that progress is made towards elimination of effluent pollutants by 1985 (see Water pollution).

(3) NIOSH has developed stringent standards for maximum permissible concentrations of many materials employed in the organic coatings industry. Asbestos, chromates, lead, cadmium, and mercury are some of the hazardous materials used, and an intensive search is going on for safe substitutes. Residual vinyl monomers in polymers, particularly vinyl chloride and acrylonitrile (qv), are being reduced greatly.

(4) The FDA issues regulations governing materials that may contact food, and a new coating meant for contact with food must pass a series of extraction tests in order to obtain FDA approval.

(5) The Toxic Substances Control ACT of 1977 requires that new manufactured materials undergo adequate testing and must meet toxicity standards (see Industrial hygiene and toxicology; Regulatory agencies).

SEYMORE HOCHBERG
E.I. du Pont de Nemours & Co., Inc.

"Guidance to State and Local Agencies in Preparing Regulations to Control Volatile Organic Compounds From Ten Stationary Categories," U.S. Environmental Protection Agency, EPA-450/2-79-004, Sept. 1979.

COATINGS, MARINE

Ships, offshore working platforms, and onshore waterfront structures are damaged by contact with the harsh marine environment. Control of this destructive action is best achieved through a program of (1) selection of the materials most resistant to deterioration, (2) design to minimize conditions favorable to corrosion, and (3) effective utilization of protective coatings and/or cathodic protection (an electrical method of preventing metal corrosion in a conductive medium by placing a charge on the item to be protected) to deter corrosion. Protective (anticorrosive) coatings impart protection to the substrate by forming a barrier to the water, salt, and oxygen which accelerate corrosion. Antifouling paints control the attachment and growth of marine fouling organisms on immersed areas.

The modern synthetic coatings have three common ingredients: solvent, binder, and pigment. Coatings that cure by chemical reaction of

applications. For example, epoxies, coal-tar epoxies, urethanes, and esters are durable and resistant to water, solvents, and chemicals.

Modern synthetic marine coatings provide much longer protection than earlier ones, but require both complete cleanliness and a profile (tooth) in order to obtain adequate bonding of prime coats. Speed abrasive (sand, grit, or shot) blasting by conventional air-pressure equipment or by newer equipment that utilizes centrifugal force to propel the abrasive helps provide an appropriate surface (see Abrasive Actions taken by personnel to eliminate particulate emissions from abrasive blasting include the use of hard, sharp, and properly abrasives that produce minimum emission of particulates, blasting a building or under a temporary shroud, and using equipment that automatically moves across a regular surface and picks up and recycles the spent abrasive.

Manufacturers of marine coatings always have printed information available on the use of their products. This information includes recommendations on the equipment to be used, mixing of components and temperature requirements, coverage rate at a recommended dry thickness, and good application practices.

Protective (anticorrosive) coatings include vinyls, chlorinated rubbers, epoxides, coal-tar epoxies, urethanes, polyesters, inorganic zincs, zinc organics, and specialized coatings (eg, solvent-free epoxies, powder coatings, plastic-coated steel electrical conduits and fittings, petrolatum-coated tapes).

Currently, the only two biocidal materials that are used extensively in antifouling paints are cuprous oxide and organotin compounds (tributyltin oxide or tributyltin fluoride). Most commercial antifouling paints use a vinyl binder, although products with other binders are marketed. Rosin or some other leaching agent must be added to cuprous oxide formulations to permit its controlled release into seawater where it is lethal to fouling larva forms. Organotins usually do not require leaching agents to dissolve slowly in seawater.

Recent research has led to the development of organometallic compounds for use in antifouling paints. A sheet material (ca 2 mm thick) of black neoprene rubber (see Elastomers, synthetic, neoprene) impregnated with tributyltin is currently marketed. Because the sheet is so thick, it acts as a larger reservoir of biocide that can result in longer-lasting control.

R.W. DRISKO
U.S. Naval Civil Engineering

Antifouling Marine Coatings, Noyes Data Corporation, 1973.

Coating Systems Guide for Hull, Deck, and Superstructure, Society of Naval Architects & Marine Engineers Report No. TR-4-10, 1973.

COATINGS, RESISTANT

Resistant or high performance coatings or linings are specialty products used to give long-term protection under difficult corrosive conditions to industrial structures. This contrasts with paint, which is used for general appearance and shorter-term protection against milder conditions, and industrial coatings, ie, coatings that are used on manufactured products (see Paint; Coatings, industrial; also Coatings processes; Coatings, marine).

There are two basic methods by which coatings or linings protect a surface. The first is based on the principle of impermeability. The method uses anodically active or inhibitive pigments in the prime coat to regulate corrosion (see Pigments). The inert impregnated system performs best as a lining where it is subject to continual wet, or immersion conditions and where it is subject to little physical abrasion. Inhibitive coatings perform best in areas where the coating is subject to weathering, atmospheric conditions, high

EXHIBIT C

McGraw-Hill DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS

Fourth Edition

Sybil P. Parker

EDITOR IN CHIEF

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On the cover: Pattern produced from white light by a computer-generated diffraction plate containing 529 square apertures arranged in a 23 x 23 array. (R. B. Hoover, Marshall Space Flight Center)

On the title pages: Aerial photograph of the Sinai Peninsula made by Gemini spacecraft. (NASA)

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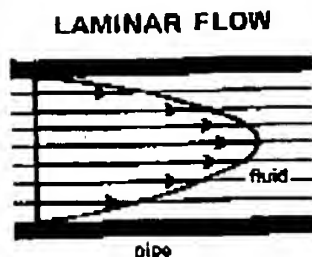
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1044 | Lamb-shift source

lamp bank | lamp



Laminar flow in a circular pipe. In this case the velocity adjacent to the wall is zero and increases to a maximum in the center of the pipe.

predicted by the Dirac electron theory, in accord with principles of quantum electrodynamics. { 'lam 'shift }

Lamb-shift source [NUCLEO] A device for producing a beam of polarized ions from one-electron atoms in their 2s excited state; the 2s and 2p levels, initially separated by the Lamb shift, are mixed by magnetic and electric fields, and selected nuclear magnetic substrates are then depopulated, leaving the remaining atoms in a state with large nuclear polarization. { 'lam 'shift 'sors }

lamb-shower See lambing storm. { 'lam 'shaŭ-ərz }

lamb-storm See lambing storm. { 'lam 'stɔrm }

lamb's wool [VERT ZOO] The first fleece taken from a sheep up to 7 months old, having natural tapered fiber tip and spinning qualities superior to those of wool taken from previously shorn sheep. { 'lamz 'wul }

Lamb wave [ACOUS] See plate wave. [ELECTROMAG] Electromagnetic wave propagated over the surface of a solid whose thickness is comparable to the wavelength of the wave. { 'lam 'wæv }

larné [TEXT] A fabric, usually of silk, rayon, or polyester, ornamented with flat metal threads. { 'la'mā }

Lamé constants [MECH] Two constants which relate stress to strain in an isotropic, elastic material. { 'lā'mā 'kän'stəns }

lamella [ANAT] A thin scale or plate. { 'lā'mel-ə }

lamella arch [CIV ENG] An arch consisting basically of a series of intersecting skewed arches made up of relatively short straight members; two members are bolted, riveted, or welded to a third piece at its center. { 'lā'mel-ə 'ärch }

lamellar bone [HISTOL] Any bone with a microscopic structure consisting of thin layers or plates. { 'lā'mel-ə 'bōn }

lamellar chloroplast [CYTOL] A type of chloroplast in which the layered structure extends more or less uniformly through the whole chloroplast body. { 'lā'mel-ə 'klōrə'pləst }

lamellar crystal [CRYSTAL] A polycrystalline substance whose grains are in the form of thin sheets. { 'lā'mel-ə 'krɪst-əl }

lamella roof [BUILD] A large span vault built of members connected in a diamond pattern. { 'lā'mel-ə 'rūf }

lamellar vector field See irrotational vector field. { 'lā'mel-ə 'vek-tər 'fēld }

Lamellibranchiata [INV ZOO] An equivalent name for Bivalvia. { 'lā'mel-ə'brāŋ'kē'ād-ə }

Lamellisabellidae [INV ZOO] A family of marine animals in the order Thecanephria. { 'lā'mel-ə'sab-ə'lē'dē }

Lamé's equations [MATH] A general collection of second-order differential equations which have five regular singularities. { 'lā'māz i'kwā-zhənz }

Lamé's relations [MATH] Six independent relations which when satisfied by the covariant metric tensor of a three-dimensional space provide necessary and sufficient conditions for the space to be euclidean. { 'lā'māz rē'lā-shənz }

Lamellaceae [BOT] An equivalent name for Labiatae. { 'lā-mē'ās-ē-ē }

Lamiales [BOT] An order of dicotyledonous plants in the subclass Asteridae marked by its characteristic gynoeceum, consisting of usually two biovulate carpels, with each carpel divided between the ovules by a false partition, or with the two halves of the carpel seemingly wholly separate. { 'lā-mē'ā-lēz }

lamina [BOT] See blade. [ANAT] A thin sheet or layer of tissue; a scalelike structure. [GEOL] A thin, clearly differentiated layer of sedimentary rock or sediment, usually less than 1 centimeter thick. [MATER] A flat or curved arrangement of unidirectional or woven fibers in a matrix. { 'lam-ə-nə }

lamina cribrosa [ANAT] 1. The portion of the sclera which is perforated for the passage of the optic nerve. 2. The fascia covering the sphenous opening in the thigh. 3. The anterior or posterior perforated space of the brain. 4. The perforated plates of bone through which pass branches of the cochlear part of the vestibulocochlear nerve. { 'lam-ə-nə krī'bros-ə }

laminal placentation [BOT] Condition in which the ovules occur on the inner surface of the carpels. { 'lam-ə-nəl 'plās-ən'tā-shən }

laminar [SCI TECH] 1. Arranged in thin layers. 2. Pertaining to viscous streamline flow without turbulence. { 'lam-ə-nər }

laminar boundary layer [FL MECH] A thin layer over the surface of a body immersed in a fluid, in which the fluid velocity

relative to the surface increases rapidly with distance from the surface and the flow is laminar. { 'lam-ə-nər 'baŭn-drē 'lā-ər }

laminar flow [FL MECH] Streamline flow of an incompressible, viscous Newtonian fluid; all particles of the fluid move in distinct and separate lines. { 'lam-ə-nər 'flō }

laminar flow control [AERO ENG] The removal of a small amount of boundary-layer air from the surface of an aircraft wing with the result that the airflow is laminar rather than turbulent; frictional drag is greatly reduced. { 'lam-ə-nər 'flō kən'trōl }

Laminariales [BOT] An order of brown, large, structurally complicated, often highly differentiated members, commonly called kelps, of the algal class Phaeophyceae; distinctive features include a life history in which microscopic, filamentous, dioecious gametophytes alternate with a massive, parenchymatous sporophyte, and a mature sporophyte typically consisting of a holdfast, stipe, and one or more blades. { 'lam-ə-nār-ē'ā-lēz }

Laminariophyceae [BOT] A class of algae belonging to the division Phaeophyta. { 'lam-i'nār-ē'ō'fis-ē-ē }

laminar sublayer [FL MECH] The laminar boundary layer underlying a turbulent boundary layer. { 'lam-ə-nər 'səb,lā-ər }

laminar wing [AERO ENG] A low-drag wing in which the distribution of thickness along the chord is so selected as to maintain laminar flow over as much of the wing surface as possible. { 'lam-ə-nər 'wɪŋ }

laminated [MATER] A sheet of material made of several different bonded layers. { 'lam-ə-nāt }

laminated composite [MATER] A composite material consisting of layers of various materials. { 'lam-ə,nād-əd kəm'pōz-ət }

laminated contact [ELEC] Switch contact made up of a number of laminations, each making individual contact with the opposite conducting surface. { 'lam-ə,nād-əd 'kən,təkt }

laminated core [ELECTROMAG] An iron core for a coil transformer, armature, or other electromagnetic device; built up from laminations stamped from sheet iron or steel and more or less insulated from each other by surface oxides and sometimes also by application of varnish. { 'lam-ə,nād-əd 'kōr }

laminated glass See nonshattering glass. { 'lam-ə,nād-əd 'glas }

laminated metal [MET] A sheet or bar of composite metal composed of two or more bonded layers. { 'lam-ə,nād-əd 'mēt-əl }

laminated plastic [MATER] A thin sheet made of superposed layers of plastic bonded or impregnated with resin or compressed under heat. { 'lam-ə,nād-əd 'plāst-ik }

laminated spring [DES ENG] A flat or curved spring made of thin superimposed plates and forming a cantilever or beam of uniform strength. { 'lam-ə,nād-əd 'sprɪŋ }

laminated wood [MATER] Board or timber composed of layers of wood glued together with the grains parallel. { 'lam-ə,nād-əd 'wud }

lamina terminalis [ANAT] The layer of gray matter in the brain connecting the optic chiasma and the anterior commissure where the latter becomes continuous with the rostral lamina. { 'lam-ə-nə,tər'mɪnāl'is }

lamination [GRAPHICS] A plastic protective film on a printed sheet that has been bonded by heat and pressure. [MATER] One of the thin punchings of iron or steel used in building up a laminated core for a magnetic circuit. [MED] An operation in embryotomy in which the skull is cut in slices. [SCI TECH] Arrangement in layers. { 'lam-ə,nā'shən }

laminectomy [MED] Surgical removal of the lateral portion of the neural arch from one or more vertebrae. { 'lam-ə'nek-tə-mē }

laminography See sectional radiography. { 'lam-ə'nāgrə'fē }

Lami's theorem [MECH] When three forces act on a particle in equilibrium, the magnitude of each is proportional to the sine of the angle between the other two. { 'lā'mēz 'thir-əm }

lamp [ENG] A device that produces light, such as an electric lamp. { 'lamp }

lampadite [MINERAL] A mineral composed chiefly of hydrous manganese oxide with as much as 18% copper oxide and often cobalt oxide. { 'lam-pə'dīt }

lamp bank [ELEC] A number of incandescent lamps connected in parallel or series to serve as a resistance load for full-load tests of electric equipment. { 'lamp 'bāŋk }

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EDITION NO.: 1

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EMERGENCY OVERVIEW:

WARNING! CAUSES EYE IRRITATION. MAY CAUSE SLIGHT SKIN IRRITATION. VAPOR AND/OR SPRAY MIST MAY BE HARMFUL IF INHALED. HARMFUL IF SWALLOWED.

This is an overview of acute and physical hazards associated with this product. Please read the entire MSDS for complete information.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "x" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous
DIPROPYLENE GLYCOL	1-5	X
MONOBUTYL ETHER		
29911-28-2		

SECTION 3 - HAZARDS IDENTIFICATION**ACUTE OVEREXPOSURE EFFECTS****EYE CONTACT:**

Causes eye irritation. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.

SKIN CONTACT:

May cause slight skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

SKIN ABSORPTION:**INHALATION:**

Vapor and/or spray mist may be harmful if inhaled.

INGESTION:

Harmful if swallowed.

SIGNS & SYMPTOMS OF OVEREXPOSURE:

Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.

CHRONIC OVEREXPOSURE EFFECTS

Avoid long-term and repeated contact.

This product either contains formaldehyde or is capable of releasing formaldehyde above 0.5 ppm under certain conditions. If this product contains free formaldehyde, formaldehyde will be listed as an ingredient in Section 2 and 11 of this MSDS; if formaldehyde is not specifically listed, this product contains ingredients capable of releasing formaldehyde under certain conditions. Formaldehyde is a potential cancer hazard, a skin sensitizer and a respiratory sensitizer. The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately. Have Material Safety Data Sheet information available.

EYE CONTACT:

Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. If irritation persists, contact a poison control center, emergency room, or physician as further treatment may be necessary.

SKIN CONTACT:

Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.

INHALATION:

Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.

INGESTION:

Gently wipe or rinse the inside of the mouth with water. Sips of water may be given. Never give anything by mouth to an unconscious person. Contact a poison control center, emergency room or physician right away as further treatment may be necessary.

SECTION 5 - FIRE FIGHTING MEASURES**FLAMMABLE PROPERTIES**

FLASHPOINT: 210 Degrees F (99 Degrees C)

FLASHPOINT TEST METHOD:

Pensky-Martens Closed Cup

UEL: Not Available.

LEL: Not Available.

AUTOIGNITION TEMPERATURE:

Not Available.

EXTINGUISHING MEDIA:

Use National Fire Protection Association (NFPA) Class B extinguishers (carbon dioxide, dry chemical or universal aqueous film forming foam) designed to extinguish NFPA Class IIIB combustible liquid fires.

PROTECTION OF FIREFIGHTERS:

Water spray may be ineffective. Water spray may be used to cool closed containers that are exposed to extreme heat. If water is used, fog nozzles are preferable. Firefighters should wear self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Closed containers may explode or burst (due to the build-up of steam pressure) when exposed to extreme heat. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

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Pittsburgh, PA 15272

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PRODUCT NAME: F/C LATEX-SEALER

SECTION 6 - ACCIDENTAL RELEASE MEASURE**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:**

Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbant should be placed in this container.

SECTION 7 - HANDLING AND STORAGE**PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:**

If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts.

STORAGE:

Protect from freezing.

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION**ENGINEERING CONTROLS:**

Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT**EYES:**

Wear safety glasses with side shields.

SKIN/GLOVES:

Wear protective clothing to prevent skin contact. Apron and gloves should be constructed of: neoprene rubber or nitrile rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. Clean contaminated clothing and shoes.

RESPIRATOR:

Where ventilation is inadequate, use a NIOSH- approved air purifying respirator with the appropriate chemical cartridges or positive- pressure, air-supplied respirator. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS

If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Key: OSHA=Occupational Safety and Health Administration;
PEL=Permissible Exposure Limit; Ceiling=PEL Ceiling Limit; STEL=PEL Short-Term Exposure Limit; Skin=OSHA Skin Designation.
Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration;
TLV=Threshold Limit Value; TWA=Time Weighted Average;
PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit; Skin= Skin Absorption Designation. [C- Ceiling Limit; S- Potential Skin Absorption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES**(FORMULA VALUES, NOT SALES SPECIFICATIONS)**

SPECIFIC GRAVITY:	1.019
PHYSICAL STATE:	Liquid
PERCENT SOLIDS:	20.45
PERCENT VOLATILE BY VOLUME:	81.250
pH:	Not available.
ODOR THRESHOLD:	Not available.
VAPOUR PRESSURE (mm Hg):	17.4 mmHg
ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the chemical family and any solvents listed in Section 2.
VAPOR DENSITY:	HEAVIER THAN AIR
EVAPORATION RATE:	36
BOILING POINT OR RANGE:	-28 - 450Degrees F
FREEZING POINT OR RANGE:	Not Applicable.
MELTING POINT OR RANGE:	Not Applicable.
OCTANOL/WATER PARTITION COEFFICIENT:	Not Applicable.
WEIGHT PER GALLON:	8.49 (U.S.) / 10.1 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY**STABILITY:**

This product is normally stable and will not undergo hazardous reactions.

CONDITIONS TO AVOID:

None Known.

INCOMPATIBLE MATERIALS:

Avoid contact with strong alkalis, strong mineral acids, or strong oxidizing agents.

HAZARDOUS POLYMERIZATION:

None Known.

HAZARDOUS DECOMPOSITION PRODUCTS:

- Carbon monoxide - Carbon dioxide - Lower molecular weight polymer fractions

SECTION 11 - TOXICOLOGICAL INFORMATION**ACUTE TOXICITY**

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
DIPROPYLENE GLYCOL MONOBUTYL ETHER 29911-28-2	1 - 5	4.05 g/kg	Not Available	Not Available

CHRONIC TOXICITY**MUTAGENICITY:**

This has not been tested for this product.

REPRODUCTIVE:

This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:**SECTION 12 - ECOLOGICAL INFORMATION****POTENTIAL ENVIRONMENTAL EFFECTS:**

Ecotoxicity No data available

ENVIRONMENTAL FATE

MOBILITY: None Known.

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BIODEGRADATION: None Known.
Bioaccumulation No data available

PHYSICAL/CHEMICAL

HYDROLYSIS: None Known.
PHOTOLYSIS: None Known.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.

Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Paint- Non-Regulated Goods
NOS Technical Name: None
Hazard Class: None
Subsidiary Class(es): None
UN Number: None
Packing Group: None

USA - RQ Hazardous Substances: None
USA-RQ Hazardous Substance None
Threshold Ship Weight:
Marine Pollutant Name: None

SECTION 15 - REGULATORY INFORMATION**INVENTORY STATUS**

U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA Inventory or is otherwise exempt from TSCA Inventory reporting requirements.

FEDERAL REGULATIONS**US Regulations**

Material/ CAS Number	Percent	CERCLA HS -	SARA EHS -	SARA 313
		RQ (LBS)	TPQ (LBS)	
DIPROPYLENE GLYCOL MONOBUTYL ETHER 20011-28-2	1 - 5	Not Listed	Not Listed	Not Listed

SARA 311/312

Health (acute): Yes
Health (chronic): No
Fire (flammable): No
Pressure: No
Reactivity: No

WHMIS HAZARD CLASS: - Class D, Division 2, Subdivision A

STATE/PROVINCIAL REGULATIONS**Additional Information**

Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen; OSHA- Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION**Hazard Rating Systems**

NFPA Rating: 2 10

HMIS Rating: 2 10

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, * =Chronic Effects.

HMIS=Hazardous Materials Identification System; NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department

REASON FOR REVISION: Section 15 has been updated. Section 1 has been updated. Section 3 has been updated. Section 2 has been updated. Changes to this section may also result in changes in sections 8, 11 and/or 15. Section 4 has been updated. Section 5 has been updated. Section 6 has been updated. Section 13 has been updated. Section 7 has been updated. Section 8 has been updated. Section 9 has been updated. Section 10 has been updated. Date. Edition.
Updated MSDS
format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200). the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations. Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

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*** END OF MSDS ***

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